REMARKS

The Final Office Action mailed September 24, 2002 has been carefully reviewed and the foregoing amendments and following remarks are submitted in response thereto. A Notice of Appeal was filed on January 24, 2003; however, the Appeal is hereby withdrawn and an RCE is filed concurrently herewith.

The drawings are objected to under 37 C.F.R. § 1.83(a) as missing an element recited by claim 24. Claim 24 is objected to due to an informality associated with an "NBTC" abbreviation. Claims 16–20 and 24–29 are rejected under 35 U.S.C. § 112, 1st Paragraph, as containing subject matter not sufficiently described within the specification. Claims 16, 19–23 and 30–32 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Faruque ("N-4 Tri-Cellular Plan With Alternate Channel Assignment, Proc. of MILCOM, Nov. 6–8, 1995, pp. 1244–1247, IEEE) in view of U.S. Patent No. 5,073,971 to Schaeffer ("Schaeffer"). Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Faruque in view of Schaeffer and in further view of PCT Publication No. WO 96/34505 to Brodie ("Brodie"). Claims 16–33 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1–8 of U.S. Patent No. 6,002,935.

The Applicant will file a terminal disclaimer as soon as an indication of allowable subject matter has been placed into the record. In response to the Examiner's drawing objection, FIG. 10 has been amended to explicitly identify the distance between cell C1 and cell C2, in the first tier of NBTC Type I cells, as "1.5 R." The distance between cell C3 and cell C4, in the second tier of NBTC Type II cells, is also equal to "1.5 R," and has been similarly identified within FIG. 10. These distances are clearly defined by the hexagonal cell geometry depicted within FIG. 10, as filed. Accordingly, the addition of these annotations do not represent new matter. The Specification has been amended to indicate the relationships depicted within FIG. 10 as filed; similarly, no new matter has been added. Claims 16 is amended to overcome the Examiner's § 112 rejection, and claim 24 is amended to overcome the Examiner's informality objection. Claim 21 is amended to more clearly recite the features of the present invention. Thus, claims 16–33 are pending in this application.

In the present invention, a higher degree of frequency reuse is realized by a frequency reuse pattern in which each frequency occurs twice in a cluster of four cells. This pattern results in a frequency reuse factor K=2. FIG. 9 illustrates an embodiment of the present

invention, consisting of a cluster of four cells C1–C4, that achieves this effect. Each base station has sectored antennae that define three generally hexagonal sectors with the cell, with a frequency set assigned to each sector. For a system including six channel sets and three sectors per cell, each channel set is allocated to two sectors within the cluster of four base stations. The allocation also provides as little as one sector between the two sectors that share a channel set. See, Application at 9–12; FIG. 10.

Description of Faruque

Faruque is generally directed to frequency reuse techniques, and discloses a method for assigning channels to sectors based on either an alternate or cyclic distribution of frequency groups. The available channels are first divided into either nine frequency groups, evenly distributed among clusters of three tri-cells, or 12 frequency groups, evenly distributed among clusters of four tri-cells. A "tri-cell" is based on a group of three hexagonal "cells" (i.e., sectors), driven by a single source (i.e., a base station), as depicted in Fig. 1. Faruque's tri-cell is, in actuality, a conventional cell with three hexagonal sectors served by a single base station, as described above. See, Page 1244.

Faruque's cellular network is constructed by stacking clusters of tri-cells in both the horizontal and vertical directions. Frequency groups are then assigned to individual sectors within each tri-cell based on either an alternate or a cyclic distribution pattern. Fig. 2.1 depicts a frequency reuse plan in which 12 frequency groups are assigned to a cluster of four tri-cells. Faruque therefore discloses frequency reuse patterns with either K=3, where each frequency group is used once in every cluster of three tri-cells (Figs. 4.1 and 4.3), or K=4, where each frequency group is used once in every cluster of four tri-cells (Figs. 2.1 and 2.4). See, generally, Pages 1244–1246. Moreover, all adjacent tri-cells are assigned different frequency groups. In other words, no frequency group is reused a second time in an adjacent tri-cell, as can be seen with reference to Figs. 2.3, 2.6, 4.2, and 4.5.

Faruque fails to teach or suggest any more, or any less, than the formation of a "tri-cell" by grouping three hexagonal sectors together at a spacing of 120°. Furthermore, Faruque fails to teach or suggest that a hexagonal sector can be subdivided in half, or in thirds, or in any fraction thereof, or that more than one directional antenna can be placed within one hexagonal sector. In other words, Faruque fails to teach or suggest that a hexagonal sector can be excited by anything other than an omni-directional source placed at the corner of the

hexagonal sector, or that a "tri-cell" can be comprised of anything other than three hexagonal sectors, grouped together at a spacing of 120°. Moreover, Faruque teaches away from using anything other than his three-sector "tri-cell" by reciting the many benefits of his "Tri-Cellular Plan." For example, "Each cell is treated as a logical OMNI, excited from the corner, separated by 120 degrees. Unlike 120 deg. sectorization scheme, this scheme enjoys trunking efficiency, reduced hardware and software complexities, reduced MTX/MTSO messaging and reduced cost" (Page 1244).

Consequently, Faruque does not disclose "a frequency reuse pattern in which each frequency set occurs twice in a cluster of four cells," as recited by amended claim 16, "six frequency sets and each frequency set is allocated to two sectors within the cluster of four base stations," as recited by amended claim 21, or "the plurality of frequency sets are assigned to each cell cluster to create a frequency reuse factor of two," as recited by claim 30. Moreover, Faruque does not teach or suggest "a first set of base stations provided in a first tier are NBTC Type I base stations that are separated from one another by a distance of 1.5 R, and a second set of base stations provided in a second tier, adjacent to the first tier, are NBTC Type II base stations that are separated from one another by a distance of 1.5 R," as recited by claim 24.

Description of Schaeffer

Schaeffer is directed to a cellular radiotelephone communications system, and more particularly, to a system including a plurality of hexagonal cells that are made up of an array of directional sector antennas. The antennas are centrally located in the cell, and each radiates into a 60° area, or sector, of the hexagonal cell. Each antenna in the cell is assigned a group of frequencies, and the frequency assignments may be repeated 2 times in a 4 cell repeat pattern, "effectively forming a two cell reuse pattern." See, Col. 2, lines 36–45. FIG. 5 depicts a frequency reuse pattern for the "preferred embodiment" of the invention. Each of the hexagonal cells are divided into 6 sectors and each of the sectors is assigned one of 12 frequency groups. Thus, Schaeffer's frequency reuse pattern requires six sectors per cell with six centrally-located, directional antenna per cell, where each sector is separated by 60° and each directional antenna radiates into a 60° area (i.e., 1/6) of the cell. Moreover, Schaeffer is entirely silent on whether more, or less, than 12 frequency groups may be assigned.

Schaeffer fails to teach or suggest any more, or any less, than the formation of a hexagonal cell by grouping six sectors together at a spacing of 60°. Furthermore, Schaeffer

fails to disclose that two sectors can be combined together, or that a beamwidth of more than 60° may be employed. In other words, Schaeffer fails to teach or suggest that a hexagonal cell can include anything other than 6 sectors, grouped together at a spacing of 60°. Moreover, Schaeffer teaches away from using a beamwidth wider than 60° by reciting the benefits of his six-sector architecture. For example, in his discussion of the prior art, Schaeffer teaches that "in order to increase frequency reuse, the antenna beam pattern is narrowed from 120° to 60°. Since a 120° antenna beam covers a wider area, it will interfere with more co-channel cells than a 60° antenna beam ... by reducing the beam width and spatially arranging antennas ... allows greater frequency reuse" (Col. 2, lines 8–20).

Consequently, Schaeffer does not disclose "base stations having sectored antennae defining three generally hexagonal sectors within the cell," as recited by amended claim 16, "six frequency sets," as recited by amended claim 21, or "each cell consisting of three sectors," as recited by claim 30. Moreover, Schaeffer does not teach or suggest "a first set of base stations provided in a first tier are NBTC Type I base stations that are separated from one another by a distance of 1.5 R, and a second set of base stations provided in a second tier, adjacent to the first tier, are NBTC Type II base stations that are separated from one another by a distance of 1.5 R," as recited by claim 24.

Summary of Brodie

Brodie discloses a method for assigning eight frequency groups among base stations having three directional antennae such that each frequency group is reused, on average, three out of every eight base stations. Brodie suggests that the beam width of the directional antennas at the base stations may be lower than the preferred 120°, such as 60° to 85°. See, e.g., Abstract; Page 3, lines 15–16.

Claims 16–33 Are Patentable Over the Cited References

The Applicant submits that Faruque, either alone or in combination with Schaeffer, fails to establish a prima facie case of obviousness.

> To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in

the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ 2d 1438 (Fed. Cir. 1991).[1]

(1) The Examiner Has Not Identified Any Teaching, Suggestion, or Motivation to Combine the References

The Examiner has not identified any teaching, suggestion, or motivation in the prior art to combine these references to arrive at the claimed invention. In establishing obviousness, the Office has the burden of pointing to some suggestion or motivation to combine teaching the references. While a reference can be utilized for all that it teaches, focusing on isolated portions of the reference or picking and choosing only that which supports a holding of obviousness is improper. See, e.g., Panduit Corp. v. Dennison Mfg. Co., 1 U.S.P.Q.2d 1593, 1602 (Fed. Cir. 1987).

The Examiner opines that "it would have been obvious ... to provide Faruque's teaching to Schaeffer for using 3-sectors cells so that the number of channels required in a certain service area can be reduced as compared to a 6-sectors cell. Therefore, it would have been obvious ... to combine the teachings of Schaeffer and Faruque for using a frequency reuse factor of 2 in base stations with 3-hexagonal sectors, for effectively [sic] reuse the bandwidth of a communications system so that the number of channels required in a certain service area can be reduced to fall within the number of available channels in such area." Final Office Action at Page 5, first partial paragraph. While Faruque and Schaeffer are generally directed to frequency reuse methods, the Examiner is incorrect in asserting that it would have been obvious to one of ordinary skill in the art to combine the teachings of these references. As discussed above, Faruque is directed to frequency reuse techniques employing three hexagonal sectors per cell, while Schaeffer is directed to frequency reuse techniques employing six sectors per hexagonal cell. The Applicant submits that one of ordinary skill in the art would not combine the teachings of these references due to the fundamentally different sectorization architectures contained therein.

For example, Schaeffer fails to disclose "base stations having sectored antennae defining three generally hexagonal sectors within the cell," as recited by amended claim 16, "six frequency sets," as recited by amended claim 21, or "each cell consisting of three sectors," as recited by claim 30. Consequently, the Examiner must point to some teaching or suggestion, in

[1] MPEP § 2142.

either reference, that would provide the motivation to combine these two disparate sectorization schemes. The Applicant submits that neither Faruque nor Schaeffer contain any such teaching or suggestion; rather, Faruque discloses only that a "tri-cell" includes three, 120° beamwidth, hexagonal sectors, while Schaeffer discloses only that a hexagonal cell includes six, 60° beamwidth sectors. Furthermore, as discussed above, each reference teaches away from the use of the specific sectorization architecture described within the other reference.

(2) The References Are Not Properly Combinable Because Their Intended Function is Destroyed

Moreover, the Examiner has not demonstrated that the references are properly combinable. For example, even though both Faruque and Schaeffer assign one channel to each sector, Faruque assigns 12 channel groups once among four tri-cells, each having three sectors, while Schaeffer assigns 12 channel groups twice among four cells, each having six sectors. In order to combine the six-sector per cell frequency reuse pattern disclosed in Schaeffer with the three-sector per "tri-cell" architecture disclosed in Faruque, Faruque's basic architecture, the OMNI-excited, 120°-spaced, hexagonally-shaped "tri-cell," must be significantly modified, i.e., e.g., by doubling the number of channels assigned to each cell, by doubling the number of hexagonal cells per "tri-cell," etc. None of these modifications are taught or suggested by Faruque, as noted above. In other words, the six-sector per cell frequency reuse pattern disclosed in Schaeffer can not be combined with the hexagonal tri-cell architecture disclosed in Faruque, because **Faruque's** hexagonally-shaped, 120°-spaced, OMNI-excited **cells will not function as intended**.

Of course, the converse reasoning may similarly be applied to Schaeffer. For example, in order to combine the three-sector per cell "tri-cell" architecture disclosed in Faruque with the six-sector per cell frequency reuse pattern disclosed in Schaeffer, Schaeffer's basic cell architecture, consisting of six directional sector antennas each radiating into 60° areas of the cell, must be significantly modified, i.e., e.g., by combining two adjacent, 60° sectors into one 120° sector, by assigning two channel groups to one 120° sector, etc. None of these modifications are taught or suggested by Schaeffer, as noted above. In other words, the hexagonal tri-cell architecture disclosed in Faruque can not be combined with the six-sector per cell frequency reuse pattern disclosed in Schaeffer because **Schaeffer's cell**, consisting of six directional sector antennas each radiating into 60° areas of the cell, **will not function as intended**.

Accordingly, because the Examiner has not pointed to some teaching, suggestion, or motivation in the prior art to combine these references, and, additionally, because the combination of Schaeffer and Faruque would destroy the intended functionality either Faruque or Schaeffer, claims 16, 21 and 30 are not rendered obvious under § 103(a). Accordingly, claims 16, 21 and 30 are allowable over the cited references. Claims 17–20, depending from claim 16, claims 22–23, depending from claim 21, and claims 31–33, depending from claim 30, respectively, are also allowable, at least the reasons discussed above.

Moreover, none of the cited references teach or suggest "a first set of base stations provided in a first tier are NBTC Type I base stations that are separated from one another by a distance of 1.5 R, and a second set of base stations provided in a second tier, adjacent to the first tier, are NBTC Type II base stations that are separated from one another by a distance of 1.5 R," as recited by claim 24. Accordingly, claim 24 is allowable; claims 25–29, depending from claim 24, are also allowable.

In view of the amendments and remarks presented above, the Applicant respectfully submits that claims 16–33 are allowable. Accordingly, the Applicant requests that the Examiner reconsider and withdraw the pending § 112 and § 103 rejections.

CONCLUSION

In view of the amendments and remarks submitted above, the Applicant respectfully submits that the present case is in condition for allowance. A notice to that effect would be greatly appreciated.

The Examiner is invited to contact the undersigned at (202) 220-4294 to discuss any matter concerning this application.

The Office is hereby authorized to charge any fees or credit any overpayments arising from this communication to Kenyon & Kenyon's Deposit Account No. 11-0600.

Respectfully submitted,

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